

**TWO ADDITIONAL STATE RECORDS OF F₁ MALE
INTERSPECIFIC HYBRID *LIMENITIS*
(*BASILARCHIA*) SPP. FORM “RUBIDUS” STRECKER
(LEPIDOPTERA: NYMPHALIDAE)¹**

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ABSTRACT: State records of single male specimens of the interspecific hybrid form “rubidus” (Lepidoptera, Nymphalidae: *Limenitis* (*Basilarchia*)) are reported from New Mexico and Kansas U.S.A. This form arises from rare mixed matings between *L. archippus* (Cr.) x *L. arthemis astyanax* (Fabr.), two closely related species which are involved in two quite differently colored mimicry complexes. The hybrids often occur when one or both of the parental species is or are rare. The New Mexican specimen involves the two southwestern desert subspecies of the parental butterflies. These two state records bring to 51 the known occurrences of these natural hybrids, all of which are males. This hybrid form has been reported from 20 states and the District of Columbia. Most of the hybrid records occur late in the flight season, except in Florida. Phenotypically and behaviorally this form represents a complete breakdown of the different mimetic resemblances present in its two parental species, thus placing this insect at a considerable selective disadvantage in natural populations.

KEY WORDS: Interspecific hybrid, *Limenitis* (*Basilarchia*), Lepidoptera, Nymphalidae.

This note reports two additional state records of F₁ interspecific hybrids between *Limenitis* (*Basilarchia*) *archippus* (Cr.), the viceroy, and the red-spotted purple, *L. arthemis astyanax* (Fabr.). These butterflies have been described as hybrid form “rubidus” Strecker 1878. Such taxonomic designations when applied to interspecific hybrids are not recognized as being valid by the International Commission of Zoological Nomenclature (ICZN) (Masters 1972). Earlier reviews of these rare and unusual insects have been reported by Mead 1872, Holdridge 1899, Platt et al. 1978, Ritland 1990, Covell 1989, 1994, Platt and Maudsley 1994, Boyd et al. 1999, and Schiefer 1999. This form occurs rarely, but with some regularity, and is broadly distributed across the United States. Between 1872 and 1998, “rubidus” hybrids have been reported from 20 states and the District of Columbia (Table 1). This hybrid insect apparently results from a very few interspecific matings occurring year after year in certain localized “hot spots.” Such “hot spots” have been reported from north-central Florida, north-eastern Georgia, southwestern Kentucky, eastern Nebraska, and east-central North Carolina (Platt et al. 1978, Platt and Greenfield 1974, Platt and Maudsley 1994, Ritland 1990, Covell 1994). Many of the records are from late in the flight season, and they occur when one or both of the parental species often are uncommon. All of the 51 known captured or observed naturally occurring specimens of these hybrids apparently have been males. There is some recent evidence that

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such interspecific hybrids are capable of backcrossing with parental females in nature (Platt et al. in review).

Table 1. Number of individuals, Locations (States), and Chronology (years) of 51 occurrences [captures, eclosions (e), and sightings (s) of hybrid form [*L. (B.) "rubidus"*] from before 1872 through 1998. (nd = no date).

Number of Individuals	Locations (States)	Chronology (Years)
1	Arizona	1979
1	Arkansas	1933
1	Delaware	1943
10 (8 ^c , 1 ^s)	Florida	1974, 1986, 1987
1	Illinois	1960
5 (1 ^e)	Georgia	1973, 1974, 1984, 1986
1	Kansas	1986
5	Kentucky	1948, 1978, 1980, 1993, 1998
2 (1 nd)	Massachusetts	1896
1	Michigan	1974
4 (3 ^s)	Mississippi	1995, 1998
2	Nebraska	1963
2	New Jersey	1880, 1910
1	New Mexico	1983
4 (2 nd)	New York	1895, 1913
2	North Carolina	1970, 1972
2 (1 nd)	Pennsylvania	Before 1872
1	Texas	1970
2	Virginia	1974, 1976
2	Wisconsin	1971, 1976
1 ^(nd)	District of Columbia	—

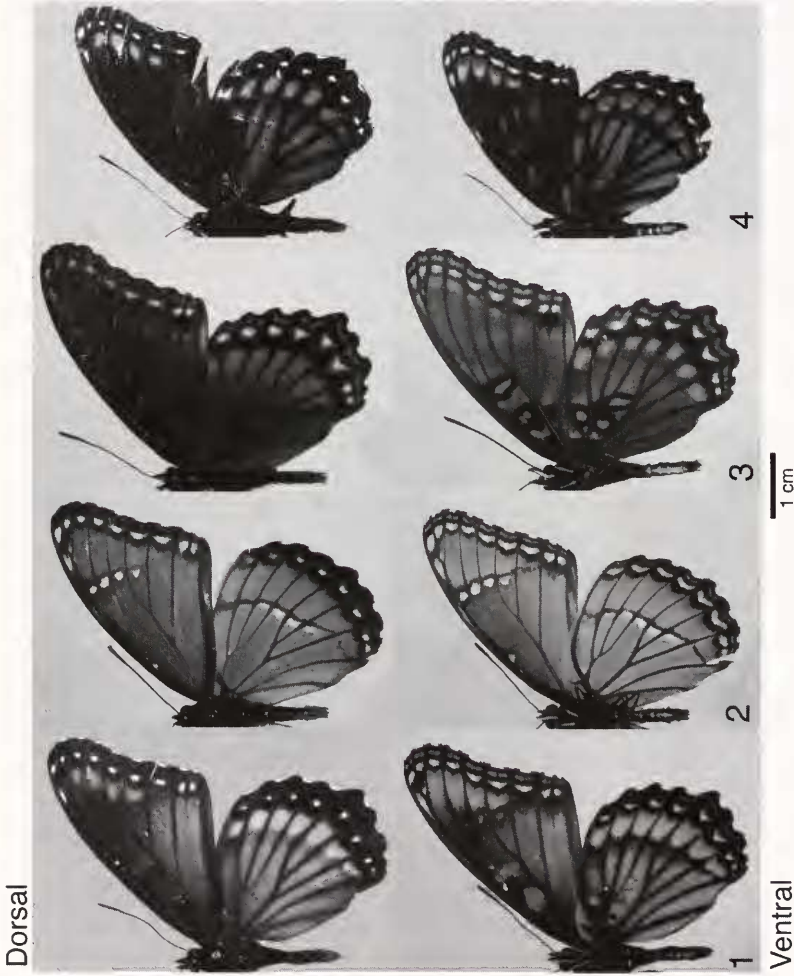
The first state record (Fig. 1) was collected in the Peloncillo Mountains, Guadalupe Canyon, Hidalgo County, New Mexico, on September 3, 1983, by S. J. Cary at an elevation of about 4700 ft. (1433 m). Mr. Cary informs A.P.P. that the collecting conditions were excellent, and that he observed over 40 species of butterflies on that day. Guadalupe Canyon passes through a short section of Arizona before turning southward and joining the Río Yaquí at Sonora, Mexico. He observed two red-spotted purples flying near where he collected the hybrid, but also notes that viceroys usually do not occur in Guadalupe Canyon at the site, although they may occur farther downstream in Mexico. In that region the two parent species are separated altitudinally, with *L. archippus* usually being found below 5000 ft. (1524 m), and *L. a. astyanax* occurring up to elevations of 8000 ft. (2438 m). He speculates that this interspecific pairing may have resulted from

an *L. archippus* straying too far upstream, thus encountering only the other species for potential mates (S.D. Cary pers. comm.).

The specimen was given to A. P. Platt by M. E. Toliver, and presently is in the Platt Collection at U.M.B.C. in Baltimore, Maryland. The collection locality indicates that this F_1 hybrid represents an interspecific cross involving the two southwestern (desert) subspecies of the parental butterflies, namely, *L. archippus obsoleta* (Edw.) x *L. arthemis arizonensis* (Edw.) (Figs. 2 and 3). The phenotype of this hybrid is of the "lighter" (more orange-brown, and hence, *archippus*-like) coloration of "rubicus," but it otherwise is typical of that of the wild hybrids for the more widely distributed eastern forms of the two parental species. Another earlier southwestern "rubicus" specimen (which also most likely represents a state record, as well) is noted from Arizona by Bailowitz and Brock 1991. The latter specimen was collected on October 13, 1979, by R. A. Bailowitz at St. David in Cochise County, in southeastern Arizona. St. David is located just southeast of Benson, Arizona, and is about 85 mi. (137 km) due west of the Peloncillo Mountains, not too far from Guadalupe Canyon.

The Kansas state record of hybrid "rubicus" (Fig. 4) was taken on August 31, 1996, by E. T. McClanahan while he was out collecting butterflies with his wife Judy, and his son Michael, in Lyon County, 12 miles west of Emporia. Michael first saw the dark *Limenitis* butterfly patrolling in a wooded area beside a gravel road where the McClanahans had stopped adjacent to some fields. The insect repeatedly returned to perch high up in a tall shrub on an embankment along the roadway. Attempting to induce flight, and perhaps bring the insect within reach, Michael tossed bits of gravel toward the butterfly, which flew out and downward, but it always managed to elude capture. E. T. M. finally climbed up the embankment and netted the insect on its perch about 10-12 ft. above the road. This butterfly is of the darker (more *L. arthemis astyanax*-like) phenotype.

Extensive laboratory hybridization of the two parental species of *Limenitis* done at U.M.B.C. by A.P.P. reveals that these interspecific crosses are fertile in both directions with regard to sex (Platt 1975, 1983, 1987). Likewise, wild interspecific pairings have been observed taking place in both directions as well (Klots 1959, Ritland 1990, and Covell 1994). When strains from the same geographic locality are used in the crosses, all of the F_1 hybrids are males, with but a single exception (Platt and Harrison 1994). Laboratory breeding of these butterflies demonstrates (contrary to what has been reported in the literature) that *L. archippus*, which prefers open fields and moist lowland meadow habitats, is oligophagous and restricted to the Salicaceae (willows and poplars) for its larval foodplants, whereas, *L. arthemis astyanax* is essentially polyphagous, feeding on a wide variety of both rosaceous and salicaceous foodplants. In New England and Maryland populations at least, the preferred foodplant of this mixed forest species is wild, or black cherry, *Prunus serotina* Ehrh. This rosaceous plant contains chemical (cyanin) deterrents which can be sensed by viceroy larvae (Flaim & Platt, pers. obs.), thus preventing them from feeding on such plants. However, the hybrid "rubicus" larvae will accept leaves from both plant families (Hanson



Figures 1-4. 1) Hybrid "rubidus" Stkr. (light morph), male, Hidalgo County, New Mexico, September 3, 1983, S. J. Cary, Leg. M. C. Toliver. 2) *L. archippus obsoleta* (Edw.), male, Arizona, E. T. Owen Coll., USNM. 3) *L. arthemis arizonensis* (Edw.), male, Brewster County, Texas, May 14, 1977, Leg. M. Rickard. 4) Hybrid "rubidus" Stkr. (dark morph), male, Lyon County, Kansas, August 31, 1996, E. T. McClanahan. Figs. 1 and 4 represent state records for the hybrid form.

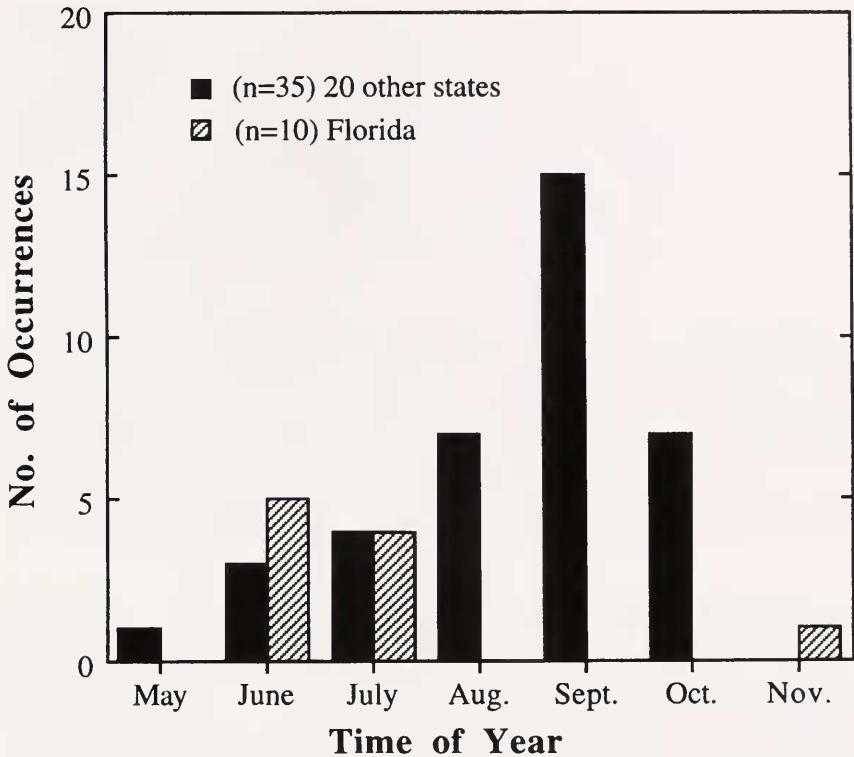


Figure 5. Monthly records of the occurrence of 45 captures, eclosions, and sightings of hybrid form *L. (B.) "rubidus"* Stkr. throughout the U.S. (solid bars) and in Florida (cross-hatched bars) between 1872-1998.

1976, de Boer and Hanson 1984). Within single broods both the lighter and darker morphs of "rubidus" can occur as siblings (Platt and Greenfield 1971, Platt et al. 1978).

The two hybrid records reported here were both taken late in the flight season, agreeing with those previously reported (Fig. 5). The only exception to this generality is in Florida, where most of this hybridization seems to take place earlier in the flight season (Ritland 1990, Platt and Maudsley 1994). Thirty-five records from other than Florida have a mean collection emergence, or sighting date of September 2 ± 1.2 days. Ten Florida records (eight representing eclosions) occur earlier (mean date = July 11 ± 16.4 days), indicating late spring or summer crosses. For six other 19th century specimens the collection dates were not recorded. The northern June records ($n=3$), shown in Fig. 5, also most likely represent either late summer or early fall matings, since, all adult admirals eclosing this early in the season must have arisen from partly grown (third instar) larvae which have over-wintered in hibernacula.

Apparently, both ecological and premating isolating mechanisms which usually serve to keep the two species separated tend to break down in the late summer and fall portion of the year throughout most of the U. S. This in part may be related to the late season decreasing photoperiod, which induces many admiral butterfly larvae of both species to diapause in the third instar, thus contributing to a scarcity of adults, and consequently of potential mates (Platt and Greenfield 1974). However, Schiefer 1999 notes situations in Mississippi when hybrid "rubidus" were sighted, even though both species were exceptionally common.

The two parental butterflies mimic two different unpalatable models: *L. archippus* mimics *Danaus plexippus* (L.) (a Müllerian relationship), whereas, *L. arthemis astyanax* mimics *Battus philenor* (L.) (a Batesian relationship). Thus, the F₁ phenotype of hybrid "rubidus" represents a complete breakdown of both of these model-mimic relationships. As such, these interspecific hybrids must be at a considerable selective disadvantage, when compared to males of either of the parental species. Their visual and structural morphology and their behaviors likely are intermediate as well. Their female counterparts have not been reported in nature, so that the continuation of this form as a species is unlikely.

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LITERATURE CITED

- Bailowitz, R. A. and J. P. Brock.** 1991. Butterflies of Southeastern Arizona. Sonoran Arthropod Studies, Inc., Tuscon, Arizona. 342 pp.
- Boyd, B. M., B. M. Boyd, and G. T. Austin.** 1999. Hybridization of *Limenitis* in the western Great Basin (Lepidoptera: Nymphalidae). *Holarctic Lepidoptera* 6:37-74.
- Covell, C. V., Jr.** 1994. Field observations of matings between female *Limenitis archippus* and male *L. arthemis* subspecies (Nymphalidae). *Journal of the Lepidopterists' Society* 48:199-204.
- Covell, C. V., Jr.** 1998. 1998 field trip review. *Kentucky Lepidopterist* 25(1):1-3.
- de Boer, G. and F. E. Hanson.** 1984. Foodplant selection and induction of feeding preference among host and non-host plants in larvae of the tobacco hornworm *Manduca sexta*. *Entomologia Experimentalis et Applicata*. 353:177-193.
- Hanson, F. E.** 1976. Comparative studies on induction of food choice preferences in lepidopterous larvae. *Symposia Biologica Hungarica* 16:71-77.
- Holdridge, L. I.** 1899. A hybrid between *Limenitis ursula* and *L. archippus*. *Entomological News* 105:131.
- Klots, A. B.** 1959. A mixed mating of two species of *Limenitis* Fabricius (Lepidoptera: Nymphalidae). *Journal of the New York Entomological Society* 67:20.

- Masters, J. H.** 1972. A proposal for the treatment of infrasubspecific variation by lepidopterists. *Journal of the Lepidopterists' Society* 26:249-260.
- Mead, T. L.** 1872. Description of a remarkable variety of *Limenitis misippus*. *Canadian Entomologist* 4:216-217.
- Platt, A. P.** 1975. Monomorphic mimicry in nearctic *Limenitis* butterflies: experimental hybridization of the *L. arthemis-astyanax* complex with *L. archippus*. *Evolution* 29:120-141.
- Platt, A. P.** 1983. Evolution of North American admiral butterflies (*Limenitis*: Nymphalidae). *Bulletin of the Entomological Society of America* 29:10-22.
- Platt, A. P.** 1987. Recent observations of North American admirals. *Maryland Entomologist* 3:18-20.
- Platt, A. P. and J. C. Greenfield.** 1971. Inter-specific hybridization between *Limenitis arthemis astyanax* and *L. archippus* (Nymphalidae). *Journal of the Lepidopterists' Society* 24:278-284.
- Platt, A. P. and J. C. Greenfield.** 1974. Report of the capture of an additional hybrid between *Limenitis arthemis astyanax* and *L. archippus*. *Journal of the Lepidopterists' Society* 28:72-75.
- Platt, A. P. and S. J. Harrison.** 1994. First record of an heterotic adult female *Limenitis (Basilarchia)* "rubidus" (Strecker) (Lepidoptera: Nymphalidae). *Entomological News* 105:33-38.
- Platt, A. P. and J. R. Maudsley.** 1994. Continued interspecific hybridization between *Limenitis (Basilarchia) arthemis astyanax* and *L. (B.) archippus* in the southeastern U.S. *Journal of the Lepidopterists' Society* 48:190-198.
- Platt, A. P., L. D. Miller, and J. Y. Miller.** in review. Possible natural backcrossing of male inter-specific admiral hybrid "arthechippus" x *L. archippus* [*Limenitis (Basilarchia)*: Nymphalidae].
- Platt, A. P., G. W. Rawson, and G. Balogh.** 1978. Inter-specific hybridization involving *Limenitis archippus* and its congeneric species (Nymphalidae). *Journal of the Lepidopterists' Society* 32:289-303.
- Ritland, D. B.** 1990. Localized interspecific hybridization between mimetic *Limenitis* butterflies (Nymphalidae). *Journal of the Lepidopterists' Society* 44:163-173.
- Schiefer, T. L.** 1999. First records of interspecific hybrids between two *Limenitis* spp. in Mississippi. *News of the Lepidopterists' Society* 41: 99.
- Strecker, H.** 1878. *Lepidoptera, Rhopalocera, and Heteroceras, Indigenous and Exotic, with Descriptions and Colored Illustrations.* Published by the Author. Reading, PA, U.S.A. 143 pp. (plus later Supplements).

Note added in proof: Additional records of *Limenitis* hybrid "rubidus" which have been reported since our manuscript was first submitted include two male specimens of the dark morph from central Missouri (Elder, 2000), one of which was collected in the early 1950s. Two other dark morphs (one very flight-worn) were reported from southern Louisiana (Ross and Marks, 2002). One of these also is an older record. Both of these accounts appear in the *News of the Lepidopterists' Society* 44 (2): 64-65 and 44(4):112-114, respectively. The two recently collected specimens are illustrated in color. The new Missouri specimen was collected on May 5, 2000, and the one from Louisiana was taken on July 29, 2000. Finally, Schiefer [2000, *News of the Lepidopterists' Society* 42(1):29] reported another dark form of this insect from Mississippi. These records are not included in this paper, but they add five specimens and two additional states to the distribution of this rather uncommon interspecific hybrid form.